

The Riverside Industrial Park Superfund Site (Site) and the Lower Passaic River (which is part of the Diamond Alkali Superfund Site) share a common boundary. This boundary is defined by the shoreline structures and bulkheads located on Lots 57, 60, 61, 63, 64, 66, 67, 69, and 70. Since the Site was built on property reclaimed from the river ~~from by~~ progressive placement of fill material, these shoreline structures and bulkheads were constructed piecemeal over time ~~in piecemeal~~ and consist of various materials, including steel sheet piling, concrete, and wood. While the steel sheet piling and concrete bulkheads are in fair to good condition (GSH/Tetra Tech, 2019), the wooden bulkheads on Lot 60, 63, 67, 69, and 70 are in poor condition and in some cases have collapsed (such as Lot 67 and Lot 69) and vegetation now covers the shoreline and bulkhead remnants.

Several migration pathways cross this boundary, allowing contaminants to be transported between the Site and the Lower Passaic River. Potential contaminant migration pathways from the Site to the river include: stormwater runoff to the river, groundwater discharge to the river, sewer pipe discharge to the river, and erosion and transport of soils to the river. Conversely, the Lower Passaic River can interact with the Site during flooding events when suspended solids from the river are transported and deposited onto the Site, or when surface water and groundwater interact and mix during high tide. Because of these interactions, the Site can be an ongoing source of contamination to the Lower Passaic River, and likewise, the river can be an ongoing source of contamination to the Site. The following sections discuss these potential interactions.

IMPACTS ON THE SITE FROM THE RIVER

The Lower Passaic River can interact with the Site during flooding events when suspended solids from the river are transported and deposited onto the Site, or when surface water and groundwater interact and mix during high tide. Flooding occurs at the Site when the high tide water elevations submerge the approximately 7-foot high bulkhead/shoreline structures. However, according to the Federal Emergency Management Agency (FEMA) flood maps, the ~~s~~Site is in an area designated as having a 0.2 percent ~~change~~chance of annual flooding or 1 percent annual ~~change~~chance of flooding with an average depth of less than 1 foot. Consequently, there are few flooding events that occur at the Site. Nevertheless, to investigate the potential impacts of flooding on the Site, seven soil samples were collected along the boundary between the Site and the Lower Passaic River and analyzed for PCDD/F congeners (a known contaminant in the Lower Passaic River). Five of these seven samples represented 0-6 inches of surface soil, and ~~the~~ other two were collected more than 6 feet bgs under impervious surfaces (concrete or asphalt). The 2,3,7,8-TCDD concentration in these five surface soils ranged from 0.377 ng/kg to 20.8 ng/kg, averaging 8.9 ng/kg. These levels are significantly lower (by approximately a factor of 30 to two orders of magnitude) than the ~~anticipated average~~ 2,3,7,8-TCDD concentration measured on suspended solids in the river (which is approximately 2801,000 ng/kg) [EPA, 2016]. The transport of Passaic-contaminated solids can also be monitored by tracing the river's distinct 2,3,7,8-TCDD/Total TCDD fingerprint ratio of 0.7 [EPA, 2014]. In the five surface soil samples collected at the Site, the 2,3,7,8-TCDD/Total TCDD ratio ranged from about 0.1 to 0.3. Because of the low ratio in ~~the Site~~ surface soils, the 2,3,7,8-TCDD material at the Site is unlikely to have ~~did not~~ originated from the Passaic River. It should also be noted that Lower Passaic River suspended solids are also impacted by ~~contaminated with~~ pesticides, particularly Dieldrin and DDT isomers. However, pesticides were not detected in the surface soils collected across the Site. Together, these data lines of evidence show that the river is not a significant source of contamination to the Site.

The surface water from the river can also interact with the groundwater under the Site during high tide events and tidal pumping. This interaction is highlighted by the brackish groundwater quality observed on the Site in shallow monitoring wells (constructed to approximately 10 feet bgs) and deep monitoring

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The EPA, 2016 citation is Diamond Alkali OU2 ROD.

Commented [YA2]: EPA, 2014 is the RI for Diamond Alkali OU2

wells (constructed to approximately 20 feet bgs). Groundwater had elevated conductivity values and elevated concentrations of sodium and other salts, indicative of salt water intrusion. Along with these salts, surface water may also be transporting contaminants from the river to the groundwater. However, based on the BHHRA, under future commercial/industrial land use, the cumulative cancer risk and HI estimates for exposure to soil and groundwater do not exceed USEPA's cancer risk range and non-cancer goal of protection of an HI = 1 ~~limits for the RME risk individual~~, except for indoor worker exposure to soil via vapor intrusion on select property lots. ~~Because of the turbulent nature of the Lower Passaic River surface water is constantly flowing back and forth, it is unlikely that there are significant concentrations of volatile compounds left in surface water to be transported~~ ing volatile compounds from the river to the groundwater and to ~~contributing~~ to this potential risk.

Commented [YA3]: This sentence as I have re-phrased it might still be awkward, so please feel free to attempt another re-write. I just didn't like the word "turbulent".

IMPACTS ON THE RIVER FROM THE SITE

The Site can also interact with the Lower Passaic River from stormwater runoff to the river, groundwater discharge to the river, sewer pipe discharge to the river, and erosion and transport of soils to the river. As documented in the ~~Site~~ history (RI Section 1.2.3), there have been many ~~documented~~ illegal releases to the river dating back to the early twentieth century, including solid waste disposal and pipe discharge. Based on the RI data, contaminated groundwater and contaminated sewer water ~~continues~~ to be released to the Lower Passaic River. For example, sewer water from pipe P-57 contained acetone at 83,000 ug/L and ethyl acetate (reported as a TIC) at 70,000 ug/L. Monitoring well MW-118 located adjacent to the river also had acetone concentrations ~~s~~ ranging from 51,000 to 71,000 ug/L during the three groundwater sampling events. Since groundwater predominantly flows east towards the river, contaminants in the groundwater ~~will could~~ discharge to the river, including free product that has been mobilized. The Site ~~contains~~ has USTs on Lot 64 containing free product that has impacted the surrounding soils. Monitoring wells and temporary well points in the vicinity of the USTs did not have a measurable thickness of NAPL, but they did have elevated BTEX levels, which are indicative of petroleum impacts to groundwater. Free product was also observed during the construction of monitoring well MW-201 on Lot 63 and temporary well point B-34 on Lot 64.

Lower Passaic River sediment is also a potentially affected medium from the Site. The most significant impacts to the sediment are from erosion and transport of contaminated soils from stormwater runoff to the river and erosion of contaminated soils along bulkhead/shoreline structures. Approximately 72 percent of stormwater runoff flows towards the river. Soil erosion is evident along the eastern boundary of the Site on pervious surfaces where soil erosion has created channels and crevices. River flows have also caused soil erosion along the bulkhead/shoreline structures. Three examples of soil erosion along the bulkhead/shoreline structures include: (1) the undermining of the concrete wall on Lot 57 and Lot 60 (as observed with void spaces underneath the concrete during drilling), (2) the sink holes observed on Lot 66/63 and Lot 63/64, and (3) the collapsed ~~d~~ or deteriorating wooden bulkheads on Lot 63 (behind Building 7), Lot 60 (behind Building 1), Lot 70 (Behind Building 16), and Lot 69 (behind Building 19). At these locations, the Lower Passaic River is in contact with contaminated soils from the Site and is eroding soils that are ultimately deposited on the river bed.

~~While a~~ remedial action that includes bank-to-bank capping is currently being designed in the lower 8.3 miles of the Lower Passaic River, in accordance with the March 2016 Diamond Alkali Operable Unit 2 (OU2) Record of Decision (ROD) for bank-to-bank capping, the Riverside Industrial Park Superfund Site has a RAO to address potential interactions between the Site and the river from ongoing impacts and contamination. Relative to the Diamond Alkali OU2 ROD Passaic set remedial goals and established Passaic ROD background levels (where remedial goals were not set) for the lower 8.3 miles of the Lower Passaic River; relevant goals and background levels include ~~contaminated soils on the Site are an on-~~

going source of contamination to the river, specifically for the ~~M~~ercury with a remedial goal of 74 ug/kg, ~~L~~ead with a ~~ROD~~-background level of 130 mg/kg, and ~~C~~opper with a ~~ROD~~-background level of 63 mg/kg. The Riverside Industrial Park Superfund Site has an RAO to address potential interactions between the Site and the river from ongoing contamination. While ~~the RI did not directly sample~~ suspended solids in stormwater runoff of eroding soils were not sampled for the Riverside RI, soil borings were collected along the bulkhead/shoreline structures in Lots 57, 60, 61, 63, 64, 66, 67, 69, and 70. Soil samples from these borings (totaling 18 borings with 36 corresponding soil samples) are representative of the type of soils that are potentially eroding and in contact with the Lower Passaic River. The following table characterizes the concentrations of ~~M~~ercury, ~~L~~ead, and ~~C~~opper in these soils, showing that soils adjacent to the bulkhead/shoreline structures (and representative of eroding soils) are frequently in exceedance of the ~~Passaic~~Diamond Alkali OU2 remedial goals and ~~Passaic~~-ROD background levels.

Parameter	Units	Minimum Level in Soil Borings	Maximum Level in Soil Borings	Location of Maximum Level in Soil Borings	Site Statistics	<u>Diamond Alkali OU2</u> ROD Remedial Goal or Background	Frequency of Site Samples Exceeding <u>OU2</u> ROD Value
Mercury	ug/kg	20	12,300	B25 (5.0-5.5 feet bgs)	Mean = 1,780 Geomean = 597 Median = 500	74	33/36
Lead	mg/kg	29.7	6,210	B30 (3.0-3.8 feet bgs)	Mean = 1,137 Geomean = 426 Median = 385	130	28/36
Copper	mg/kg	19.1	1,040	B33 (0.5-1.5 feet bgs)	Mean = 135 Geomean = 87 Median = 82	63	24/36
Statistics based on 18 borings associated with 36 <u>corresponding</u> soil samples from 0-13 feet bgs. Borings include: B9, B10, B23, B24, B25, B30, B32, B33, B51, B53, B63, B65, B67, B71, B74, B84, B87, and B88							

In addition to examining these 18 soil borings collected along the bulkhead/shoreline structures collectively, an additional comparison was completed for borings located adjacent to collapsed bulkhead/shoreline structures.

- Soil samples from three borings (B30, B32, B87) collected behind Building 7 on Lot 63 are representative of the soils eroding behind the collapsing wooden bulkhead. In these samples, ~~M~~ercury ranged from 5,200 ug/kg to 1,100 ug/kg compared to the ~~Passaic~~Diamond Alkali OU2 remedial goal of 74 ug/kg; ~~L~~ead ranged from 1,690 mg/kg to 6,210 mg/kg compared to ~~Passaic~~the Diamond Alkali OU2 ROD background value of 130 mg/kg; and ~~C~~opper ranged from 109 mg/kg to 337 mg/kg compared to the ~~Passaic~~Diamond Alkali OU2 ROD background value of 63 mg/kg.
- Soil samples from ~~the~~ soil boring B63 collected behind Building 19 on Lot 69 are representative

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of the soils eroding behind the collapsed wooden bulkhead. In these samples, ~~M~~mercury ranged from 140 ug/kg to 350 ug/kg compared to the ~~Passaic~~Diamond Alkali OU2 remedial goal of 74 ug/kg; ~~H~~lead ranged from 126 mg/kg to 440 mg/kg compared to the ~~Passaic~~Diamond Alkali OU2 ROD background value of 130 mg/kg; and ~~C~~copper ranged from 31.6 mg/kg to 83.2 mg/kg compared to the ~~Passaic~~Diamond Alkali OU2 ROD background value of 63 mg/kg.

- Soil samples from ~~the~~ soil boring B84 is the closest boring to the sink hole located between Building 17 and Building 7 and is representative of the soils potential eroding in the sink hole. In these samples, ~~M~~mercury ranged from 42 ug/kg to 9,600 ug/kg compared to the ~~Passaic~~Diamond Alkali OU2 remedial goal of 74 ug/kg; ~~H~~lead ranged from 29.7 mg/kg to 236 mg/kg compared to the ~~Passaic~~Diamond Alkali OU2 ROD background value of 130 mg/kg; and ~~C~~copper ranged from 20.4 mg/kg to 190 mg/kg compared to the ~~Passaic~~Diamond Alkali OU2 ROD background value of 63 mg/kg.

These data suggest that the Site ~~will be~~is an ongoing source of contamination to the ~~Lower Passaic~~ River ~~that may recontaminate the Diamond Alkali OU2 remedy if left unaddressed following the implementation of the Passaic remedial design.~~

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